

THREE NEW SPECIES OF *IXORA* (RUBIACEAE) FROM THE STATE OF TOCANTINS, BRAZIL

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ABSTRACT

During the preparation of the Rubiaceae treatment for the *Flora de Goiás e Tocantins*, three undescribed species of *Ixora* were found, all understory shrubs from the state of Tocantins (Brazil). ***Ixora congestiflora*** Delprete is known from two collections, one from the Parque Estadual do Cantão, just north of the Ilha do Bananal, and the other from the state of Maranhão, near the Tocantins River, in semideciduous and gallery forests with Amazonian influence. ***Ixora araguaiensis*** Delprete is also known from two collections from northern Tocantins, near the Araguaia River. ***Ixora irwinii*** Delprete is known by a few collections from the gallery forests of northern Tocantins. The three species are here described and illustrated. A key to the native species of Goiás and Tocantins is included.

KEY WORDS: *Ixora*, Ixoroideae, Rubiaceae, Tocantins, Brazil, Amazon Basin

RESUMO

Durante a preparação do tratado das Rubiaceae para a *Flora de Goiás e Tocantins*, foram encontradas três novas espécies de *Ixora*, sendo todas representadas por arbustos umbrófilos das florestas do Estado de Tocantins. ***Ixora congestiflora*** Delprete é conhecida por duas coletas, uma no Parque Estadual do Cantão, ao norte da Ilha do Bananal, e a outra no Estado de Maranhão, perto do Rio Tocantins, em florestas semidecíduas e de galeria com influência amazônica. ***Ixora araguaiensis*** Delprete é também descrita por duas coletas realizadas no norte do Estado de Tocantins, perto do Rio Araguaia. ***Ixora irwinii*** Delprete é conhecida por poucas coletas em florestas de galeria no norte do Estado de Tocantins. As três espécies são aqui descritas e ilustradas. Uma chave para as espécies nativas dos Estados de Goiás e Tocantins é incluída.

PALAVRAS CHAVE: *Ixora*, Ixoroideae, Rubiaceae, Tocantins, Brasil, Bacia Amazônica.

The state of Tocantins was separated from the state of Goiás in 1988, and since then the Brazilian government encouraged its economic development through the creation of new cities and new roads, and by stimulating immigration from other Brazilian states. For example, Palmas, the state capital and the newest city in Brazil, in 2007 has already grown to more than 200,000 inhabitants, and many other new urban agglomerations have been founded throughout the state during the last decade. As for the vegetation, the southern portion of the state is located within the Brazilian Savannah (Cerrado Biome). Whereas, the central-northern portion of the state is an area of transition between the Savannah and the Amazon Basin, with a floristic composition from both biomes and species unique to this vegetation. This is particularly true for the floristic composition of the gallery forests along water courses flowing northwards, which act as migratory routes connected with the Amazon Basin. This region continues to be botanically little-known, and only recently has received some attention through several botanical expeditions organized by local institutions. At the same time, the entire state is under rampant anthropic pressure due to aggressive and extensive farming, construction of new state roads leading to remote areas, and massive human migration that took place during the last two decades. In addition, even the potentially protected areas are not safe from this ongoing environmental destruction, as it is common to see large herds of cows grazing among the vegetation of the state and national parks present in this state.

During the preparation of the Rubiaceae treatment for the *Flora de Goiás e Tocantins*, three interesting species of *Ixora* were encountered. All of them are understory shrubs collected in the forests of the central-northern portion of the state of Tocantins. After consulting all the available literature dedicated to South

American *Ixora* (Müller Argoviensis 1875, 1881; Standley 1937; Steyermark 1967; Delprete 2003, 2007, submitted; Delprete & Cortés-B. 2007; Delprete et al. 2005; Taylor & Steyermark 2004), and comparison with the specimens present in herbaria with large Brazilian collections (see acknowledgments), it was concluded that they are, in fact, new to science. One species, *Ixora congestiflora* Delprete is known from two collections, one from the Parque Estadual do Cantão, just north of the Ilha do Bananal, and the other from the state of Maranhão, near the Tocantins River, in semideciduous and gallery forests with Amazonian influence. The second species, *Ixora araguaiensis* Delprete is also known from two collections from northern Tocantins, near the Araguaia River. The third species, *Ixora irwinii* Delprete, is known from a few collections from gallery forests in northern Tocantins. With these three new species, described and illustrated below, and a few unpublished synonymies (Delprete, submitted), the number of Neotropical species of *Ixora* is approximately 45, which is the same number earlier estimated by Delprete (2003).

1. *Ixora congestiflora* Delprete, sp. nov. (Fig. 1). TYPE: BRAZIL: TOCANTINS: Mun. Caseara, Parque Estadual do Cantão, transecto 11, floresta estacional semidecídua, 09°18'00"S, 50°01'57"W, 15 Jan 2000 (fl), P.E. Nogueira & M. Richter 692 (HOLOTYPE: IBGE; ISOTYPE: NY).

Ab *Ixora bracteolari* Müll. Arg., quae similis inflorescentia compacta et pauciflora, differt bracteis subtendentibus nullis (nec bracteis subtendentibus foliaceis), alabastris in parte summa fusiformibus (nec ovoideis), et corollis 13–14.5 mm longis (nec 7.5–8 mm longis).

Shrub to 2 m tall; branchlets glabrous. **Stipules** basally connate, 3.5–8 × 3–4 mm, base ovate, 1.5–4 mm long, arista 2–4 mm long, glabrous outside, densely sericeous-pubescent and intermixed with colleters inside. **Leaves** opposite, petiolate; petioles 5–15 mm long, glabrous; blades obovate to oblanceolate, (3.5–)7.3–12.5 × (1.2–)3–4.5 cm, base acute or decurrent, apex obtuse to acute, or acuminate (acumen deltoid, 5–7 mm long), subcoriaceous, glabrous throughout; secondary veins 12–18 each side, subsecondary veins parallel, about the same number as the secondaries. **Inflorescences** terminal, subpedunculate, very compact, reduced-trichotomous, glabrous throughout, 21–30-florous; the three branchlets 1–2 mm long, ending with three 2–3(–4)-florous cymules; bracts subtending the cymules ovate-acuminate, 1.5–2 mm long; bracteoles 1 or 2 each flower, ovate, 0.5–0.7 mm long, glabrous. **Flower buds** with tube narrowly-cylindrical, and fusiform in upper part (lobed portion). **Flowers** sessile. **Hypanthium** ovoid, 0.5–0.7 mm long, glabrous. **Calyx** cupular; tube 0.5–1.4 mm long; lobes unequal, narrowly triangular, 0.5–1.2 mm long, glabrous. **Corolla** hypocrateriform, 13–14.5 mm long, red externally, cream-white internally; tube narrowly-cylindrical, 8–8.5 × 0.7–0.9 mm, glabrous throughout; lobes narrowly-lanceolate, 5–6.5 × 1.5–1.8 mm, apex acuminate. **Stamens** exserted, reflexed among the corolla lobes; anthers oblong, ca. 3 mm long. **Style** exserted just above the mouth, 9.5–10 mm long; style branches narrowly oblong, 0.7–1 mm long (not fully expanded). **Fruits** unknown.

Distribution and ecology.—Known only from two collections, as a shrub growing in semideciduous seasonal forest in the Parque Estadual do Cantão, near the Araguaia River, in the municipality of Caseara, and the other from the state of Maranhão, in gallery forest near the Tocantins River (on the other side of the state of Tocantins, and an area soon to be submerged because of the construction of a dam).

Taxonomic observations.—This species is similar to *Ixora bracteolaris* Müll. Arg. (Müller Argoviensis 1875, 1881; Delprete 2007), because of the fasciculate, pauciflorous inflorescence, but differs from it by the absence of subtending bracts (vs. subtending bracts foliose, oblong-elliptic, 5–12 × 2–3 mm in *I. bracteolaris*), floral buds fusiform in the upper part (vs. ovoid in the upper part), and corollas 13–14.5 mm long (vs. 7.5–8 mm long).

Additional specimens examined: BRAZIL: MARANHÃO: Mun. Estreito, left margin of Tocantins River, mouth of Rio Feio, 140 m, 06°44'15"S, 47°29'26"W, 14 Jan 2008 (fl), G.P. Silva & G.A. Moreira 12598 (CEN, UFG).

2. *Ixora araguaiensis* Delprete, sp. nov. (Fig. 2). TYPE: BRAZIL: TOCANTINS: Mun. Pium, Ilha do Bananal, Parque Nacional do Araguaia, Posto de fiscalização do Projeto Quelônios da Amazônia, 09°50'57"S, 50°11'31"W, 190 m, 26 Mar 1999 (fl), M.A. da Silva, R.C. Mendonça, E. Cardoso, A.D. dos Santos, N.G. Sousa, N.R. Oliveira & J.T. dos Santos 4164 (HOLOTYPE: IBGE; ISOTYPE: NY).

Frutex 1 m alta *Ixorae brevifoliae* Benth. similis inflorescentiis terminalibus corymbosis vel paniculatis, sed differt statura minore (nec statura arboris ad 20 m altae), inflorescentis 12–18-floris (nec 45–150-floris), tubo corollae medium versus contracto (nec tubo corollae cylindrico), venis secundariis foliorum utrinque 10–15 (nec 15–40).

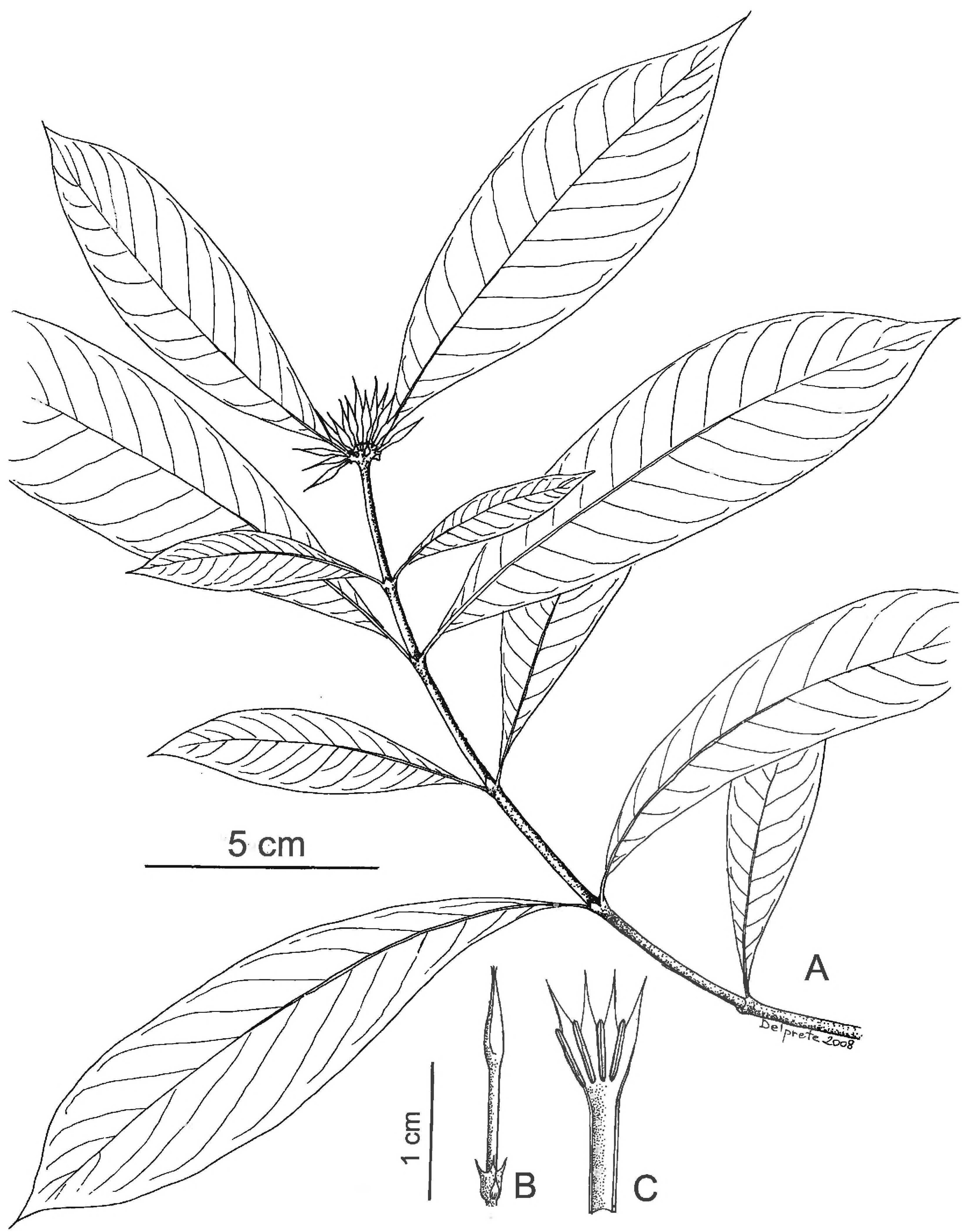


FIG. 1. *Ixora conges tiflora* Delporte. A. Branchlet with terminal inflorescence. B. Flower bud. C. Open flower at anthesis. (from Nogueira & Richter 692, NY).

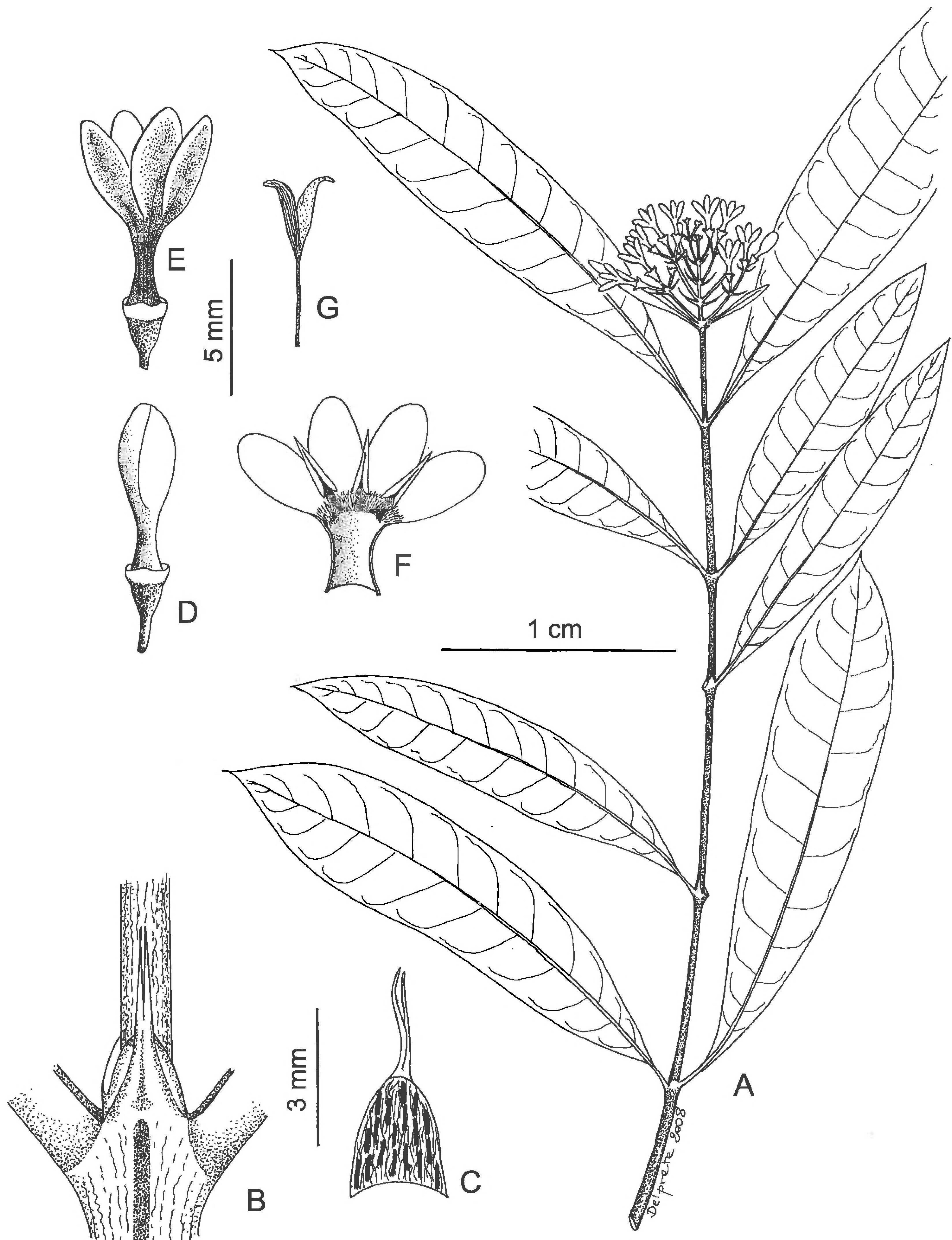


FIG. 2. *Ixora araguaiensis* Delprete. A. Branchlet with terminal inflorescence. B. Node with petiole bases and bifid stipule. C. View of adaxial face of stipule, showing pubescence and colleters. D. Flower bud. E. Flower at anthesis. F. Open flower at anthesis, with one anther removed. G. Style (from M.A. da Silva et al. 4164, NY).

Shrub ca. 1 m tall; branchlets glabrous. **Stipules** basally connate, 3.5–8 × 3–4 mm, base ovate to triangular, 1.5–2.5 mm long, arista 1.5–2.5 mm long, papyraceous, glabrous outside, densely sericeous-pubescent and intermixed with colleters inside. **Leaves** opposite, petiolate; petioles 7–15 mm long, glabrous; blades oblong-elliptic to oblong-ob lanceolate, 7.5–11 × 1.7–3 cm, base acute to decurrent, apex obtuse to acute, or shortly acuminate (acumen, when present, deltoid, 3–5 mm long), subcoriaceous, glabrous throughout; secondary veins 10–15 each side, subsecondary veins reticulate (rarely subparallel) and 2–4 for each secondary vein. **Inflorescences** terminal, pedunculate, corymbose, erect-pubescent, with 2–4 pairs of lateral branches, 12–18-florous; branchlets 5–18 mm long, ending with three 3(4)-florous cymules; bracts subtending the cymules oblong-acuminate, 1.5–3 mm long; bracteoles 1 or 2 each flower, narrowly oblong, 0.5–1.5 mm long, glabrous. **Flower buds** with tube cylindrical, and ellipsoid in upper part (lobed portion), pale yellow. **Flowers** sessile or pedicellate; pedicels (when present) 1–3 mm long. **Hypanthium** obovoid, 1–1.3 mm long, glabrous or sparsely puberulent. **Calyx** cupular, 0.3–0.5 mm long, truncate or undulate, rarely with shallowly triangular lobes, glabrous. **Corolla** hypocrateriform, 7.5–8 mm long, white; tube gradually narrowing toward the middle, 3–3.5 mm long, 1–1.3 mm wide at base and at mouth (0.5–0.7 mm wide at middle portion), glabrous outside, sparsely pubescent at mouth internally; lobes elliptic-ovate, 4.5–5 × 1.7–2 mm, apex obtuse or round. **Stamens** exserted among the corolla lobes; anthers narrowly oblong, 1.8–2 mm long, acuminate. **Style** exserted well above the mouth, 6–7 mm long; style branches lanceolate, ca. 2 mm long. **Fruits** unknown.

Distribution and ecology.—Known only from the type material and an additional collection, near the Araguaia River, as an understory shrub growing in sandy soil, in northern Tocantins.

Observations.—To my knowledge, *Ixora araguaiensis* is unique within the genus because of its bifid stipules, as *Ixora* is traditionally characterized by stipules with one arista. In several other species, older stipules break up irregularly into two units, but this is not the case in *I. araguaiensis*, because its stipules have two aristae (sometimes basally connate) since very early stage (Fig. 2B–C). However, the consistency of this character within the species remains to be confirmed, as it is currently known from only two collections.

Conservation.—A rare species collected in the Parque Nacional do Araguaia, in the municipality of Pium. Although it was collected inside a national park, this species should be included in the category with imminent threat of extinction, due to the presence of large herds of cows grazing on the vegetation of this park, especially during the dry season (May–September).

Etymology.—The specific epithet of this taxon is dedicated to both the river and the national park where it was collected.

Taxonomic observations.—This species is similar to *Ixora brevifolia* Benth. (Delporte 2003, 2007) because of the terminal, corymbose to paniculate inflorescences, but differs by being a shrub ca. 1 m tall (vs. tree to 20 m tall in *I. brevifolia*), with 12–18-florous inflorescences (vs. 45–150-florous), corolla tube gradually narrowing toward the middle (vs. cylindrical) and leaf blades with 10–15 secondary veins each side (vs. 15–40 veins each side).

Additional specimen examined: **BRAZIL: TOCANTINS**: Araguaia River, right margin, between Rio Caiapó and Santana do Araguaia [Pará], várzea vegetation, 12 Aug 1978 (fl), N.T. Silva 4800 (NY).

3. *Ixora irwinii* Delporte, sp. nov. (Fig. 3). TYPE: BRAZIL: TOCANTINS: 1 km S of Araguaína, at Rio das Lontras, 300 m, 15 Mar 1968 (fr), H.S. Irwin, H. Maxwell & D.C. Wasshausen 21221 (HOLOTYPE: UB; ISOTYPE: NY).

Ixorae pubescenti Willd. ex Schult. & Schult. f. similis inflorescentiis terminalibus paniculatis et alabastris in parte summa fusiformibus, sed differt ramulis glabris (nec pubescentibus), laminis foliorum 4.5–11.5 cm longis (nec 18–30 cm longis) venis secundariis utrinque 10–15 (nec 20–25), rhachidi glabra (nec dense hirsuta), corollis 9–10 mm longis (nec 15–17 mm).

Shrub 0.8–1 m tall; branchlets glabrous. **Stipules** basally connate, 3.5–8 × 3–4 mm, base ovate, 2–3.5, arista 1.5–2.5 mm long, glabrous outside, densely sericeous-pubescent and intermixed with colleters inside.

Leaves opposite, petiolate; petioles 7–15 mm long, glabrous; blades elliptic, oblong-elliptic to obovate, 4.5–11.5 × 1.5–4.5 cm, base acute to decurrent, apex obtuse to acute, or acuminate (acumen deltoid to narrowly triangular, 5–12 mm long), subcoriaceous, glabrous throughout; secondary veins 10–15 each side,

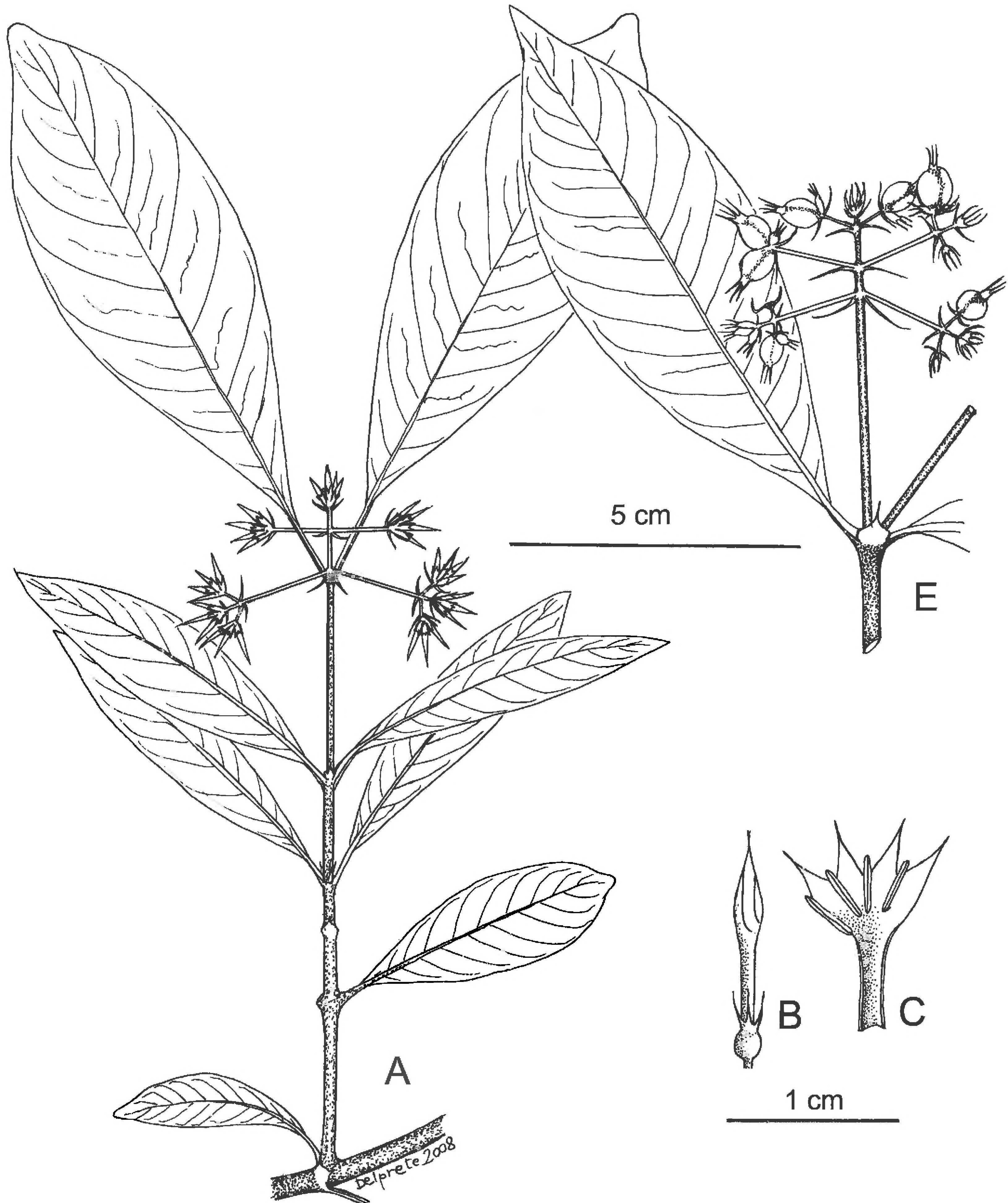


FIG. 3. *Ixora irwinii* Delprete. A. Branchlet with terminal inflorescence. B. Flower bud. C. Open flower at anthesis. D. Branchlet with terminal infructescence (A–D from Neves et al. s.n., UFG 29847; E from H.S. Irwin et al. 21221, NY).

subsecondary veins parallel and about the same number as the secondaries. **Inflorescences** terminal, sessile or pedunculate, corymbose to short-paniculate, glabrous throughout, with 2–3 pairs of lateral branches, (27–)30–75-florous; branchlets 7–18 mm long, ending with three 5–7-florous cymules; bracts subtending the cymules ovate-acuminate, 2–3 mm long; bracteoles 1 or 2 each flower, ovate, 1.5–2.5 mm long, glabrous. **Flower buds** with tube narrowly cylindrical, and fusiform in upper part (lobed portion). **Flowers** sessile or subpedicellate; pedicels (when present) to 1 mm long. **Hypanthium** obovoid, ca. 1 mm long, glabrous. **Calyx** cupular; tube ca. 1 mm long; lobes 4, unequal, linear to acicular, 0.5–1.5 mm long, glabrous. **Corolla** hypocrateriform, 9–10 mm long, red externally, cream-white internally; tube narrowly-cylindrical, 4–4.5 × 0.5–0.7 mm, glabrous throughout; lobes narrowly-lanceolate, 4.5–5 × 1.7–2 mm, apex acuminate. **Stamens** exserted and reflexed among the corolla lobes; anthers oblong, 2.8–3 mm long. **Style** exserted just above the mouth, 5.5–6 mm long; style branches narrowly oblong, 0.5–0.7 mm long (not fully expanded). **Fruits** subglobose to oblong-ellipsoid, subdidymous, 6.5–7 × 5–5.5 mm, glabrous, passing from red to vinaceous to almost black at maturity.

Distribution and ecology.—Known only from a few collections as an understory shrub growing in gallery forests of northern Tocantins.

Conservation.—A rare species in need of urgent protection because the few collections known are from areas without formal protection or from farm land.

Etymology.—The specific epithet of this taxon is dedicated to Howard Irwin, indefatigable collector who worked for the New York Botanical Garden, organized and carried out the project *Flora of the Brazilian Planalto* during 1964–1975, and is the first collector of this species.

Additional specimens examined: **BRAZIL. TOCANTINS:** Faz. Neto, Rio Água Boa, 8°12'52"S, 48°09'57"W, 12 Jan 2001 (fl), S.F. Lolis et al. 213 (HTO, UFG); Mun. Tanqueira, floresta de galeria, 8°11'49"S, 48°08'48"W, 16 Dec 2001 (fl), S.F. Lolis et al. 357 (HTO, UFG); Mun. Paraíso do Tocantins, Fazenda Uberaba, 10°09'36"S, 48°55'32"W, 14 Dec 1999 (fl), Neves et al. s.n. (HTO 7405).

Taxonomic observations: This species is similar to *Ixora pubescens* Willd. ex Schult. & Schult. f. in Roem. & Schult. because of the terminal, paniculate inflorescences and flower buds fusiform in the upper part (lobed portion), but differs by having glabrous vegetative branchlets (vs. puberulent in *I. pubescens*), leaf blades 4.5–11.5 cm long (vs. 18–30 cm long) with 10–15 secondary veins each side (vs. 20–25 secondary veins each side), glabrous rachis (vs. densely hirsute), and corollas 9–10 mm long (vs. 15–17 mm long).

KEY TO THE NATIVE SPECIES OF IXORA IN THE STATES OF GOIÁS AND TOCANTINS, BRAZIL

1. Inflorescence very compact, with branches 1–2 mm long ***I. congestiflora***
1. Inflorescence not as compact, with branches more than 7 mm long.
 2. Flower buds oblong-ellipsoid in upper part (tip round to obtuse).
 3. Shrub ca. 1 m tall; leaf blades with 10–15 secondary veins on each side; inflorescence 12–18-florous; corolla tube gradually narrowing toward the middle ***I. araguaiensis***
 3. Tree to 20 m tall; leaf blades with 15–40 secondary veins on each side; inflorescence 45–150-florous; corolla tube cylindrical ***I. breviflora***
 2. Flower buds fusiform in upper part (tip acute to acuminate).
 4. Vegetative branchlets glabrous; leaf blades 4.5–11.5 cm long, with 10–15 secondary veins on each side; rachis glabrous; corollas 9–10 mm long ***I. irwinii***
 4. Vegetative branchlets puberulent; leaf blades 18–30 cm long and with 20–25 secondary veins on each side; rachis densely hirsute; corollas 15–17 mm long ***I. pubescens***

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